TB1056: HPLC Analysis of Biodiesel using the PL-ELS 2100 Evaporative Light Scattering Detector

Keywords

HPLC, ELSD, Cyano, Biodiesel, Lipids, Hexane, MTBE

Interest in biodiesels has increased over recent years due to their environmental benefits. Biodiesel is a renewable fuel composed of methyl esters of fatty acids that can be produced from almost any vegetable oil, animal fat, or used cooking oil. It has similar properties to ordinary diesel fuel and can be used in conventional diesel engines. Crops such as sunflower and rapeseed are the preferred source for producing quality biodiesels, as biodiesels made from waste products such as used cooking oils and animal fat require more processing, via transesterification, before they are suitable to use.

Biodiesels contain complex mixtures of fatty acids, lipids and esters, all of which possess weak or no UV chromophore. Consequently, fatty acids and lipids are often derivatized to enhance their UV absorbance or to facilitate their detection by GC-MS. Such an approach is time-consuming and difficult to apply to complex mixtures.

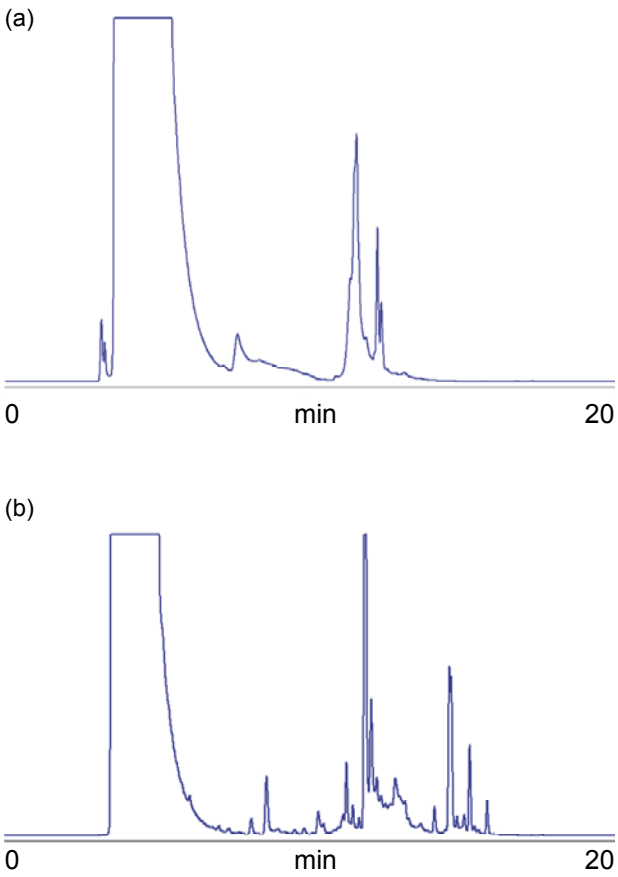
Evaporative light scattering detection (ELSD) provides a beneficial alternative for the analysis of biodiesels, because it is capable of detecting any compound that is less volatile than the mobile phase, and is not dependent on the optical properties of the analyte. ELSD also removes the need to derivatize fatty acids and lipids, thus increasing sample throughput. Unlike UV and RI detection, ELSD is fully gradient compatible, displaying excellent baseline stability. This is a key advantage when analysing such complex samples as biodiesel, because gradient elution is necessary to achieve the desired separation and resolution.

This article highlights how the PL-ELS 2100 can be used to determine the composition of vegetable oil-based biodiesels which is of paramount importance within the petroleum industry. The chemical composition of the starting material determines the quality and properties of resulting biodiesel. Biodiesel from different sources can differ in their fatty acid composition as highlighted in Figures 1a and 1b, which display two biodiesels from different sources of vegetable oil. Animal fats can contain large amounts of free fatty acids that cannot be converted to biodiesel by transesterification, due to the formation of soaps that prevent separation of the biodiesel from glycerine.

The PL-ELS 2100 provides this sample information in a single chromatogram, offering a fast and reliable means of determining the quality and properties of biodiesel.

Column:	BDS Hypersil Cyano 3µm, 250x4.6mm
Eluent A:	0.4% Acetic acid in Hexane
Eluent B:	0.4% Acetic acid in Methyl tert-Butyl Ether (MTBE)
Gradient:	100% A hold 5 mins; 0-80% B 10 mins (hold 2 mins); 80-0% B in 3 mins
Flow Rate:	1.0ml/min
Inj Vol:	20µl
Detector:	PL-ELS 2100 (neb=40°C, evap=90°C, gas=0.8 SLM)

Figures 1a and 1b - HPLC Separation of Two Vegetable Oil-based Biodiesels using PL-ELS 2100



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